

THE ANALYST.

MAY, 1902.

PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS.

THE monthly meeting of the Society was held on Wednesday evening, April 9. The President (Dr. J. Augustus Voelcker, M.A., B.Sc.) occupied the chair.

The minutes of the previous meeting were read and confirmed.

Certificates of proposal for election to membership in favour of Messrs. Walter Henry Jollyman, A.I.C., John T. Norman, John Golding, F.I.C., and William Bowen, were read for the second time; and certificates in favour of Messrs. Meredith Wynter Blyth, B.A. (Cantab.), B.Sc. (London), F.I.C., Public Analyst for the Boroughs of Brighton and Eastbourne, and Walter Frederick Sutherst, Ph.D. (Geneva), A.I.C., Analyst and Lecturer in Chemistry at the Cheshire Agricultural College, Holmes Chapel, Crewe, were read for the first time.

Dr. J. J. L. van Rijn was elected a member of the Society.

The following papers were read: "Alkaline Waters from the Lower Greensand," by W. W. Fisher, M.A.; "The Rapid Estimation of Boric Acid in Butter," by H. Droop Richmond and J. B. P. Harrison; "The Detection and Estimation of Minute Quantities of Sulphuretted Hydrogen in Coal Gas," by W. J. Dibdin and R. G. Grimwood; "The Hexabromides of Glycerides and Fatty Acids," by John Walker and George Warburton; and a "Note on the Estimation of Mineral Oil in Rosin Oil," by John Walker and Charles D. Robertshaw.

ON THE INDIRECT ESTIMATION OF ALKALIES IN WATERS.

BY W. W. FISHER, M.A., F.I.C.

(Read at the Meeting, March 5, 1902.)

IN the analysis of waters where mineral constituents have to be estimated, the more abundant bases determined are the lime, magnesia, and soda (inclusive of potash), and the acid radicles are usually chlorine, sulphuric acid, carbonic acids, and possibly nitric acid. After such determinations have been made, it becomes a somewhat tedious task to calculate the quantities of the compounds present, and much arithmetical work is involved in finding out whether the estimations duly balance each other. But this work of computation is greatly simplified if the relative molecular proportions of the several acids and bases are first obtained by dividing the quanti-

ties of each by their molecular weights, and taking the totals of acids and bases separately. If the work is absolutely correct, the totals will be alike, and they will be always near each other if the determinations are good; while any marked difference would indicate some analytical error, as only neutral compounds are present in the total solid residue.

The following analysis will serve as an illustration :

	Grains per Gallon.	Molecular Weights.	Molecular Proportions.
Total solids dried at 100° C. ...	243·00		
Total solids dried at 240° C. ...	230·00		
Soda, Na ₂ O ...	53·14	÷ 62	0·8571
Magnesia, MgO ...	11·99	÷ 40	0·299
Lime, CaO ...	35·28	÷ 56	0·630
Total of bases ...	100·41		1·7861
Chlorine, Cl ₂ ...	18·00	÷ 71	0·2535
Sulphuric acid, SO ₃ ...	103·88	÷ 80	1·2985
Carbonic acid, CO ₂ ...	9·55	÷ 44	0·2170
Nitric acid, N ₂ O ₅ ...	0·84	÷ 108	0·0077
Total of acids ...	132·27		1·7767
Deduct oxygen = Cl ₂ ...	4·07		
	128·20		
Total of salts ...	228·58		
Silica, etc. (difference) ...	1·42		
Total solids ...	230·00		

The subsequent work of combining the acids and bases, apportioning to each its due quantity, becomes very simple when the molecular proportions are employed, as 0·2535 molecules of chlorine will require 0·2535 molecules of sodium to form sodium chloride, no correction for the equivalent oxygen being required; and after the nitric acid the remaining soda—viz., 0·5959—will neutralize an equal number of sulphuric acid molecules, and so on till all the salts are obtained.

	Molecules.
(2) NaCl ...	0·2535 × 117 = 29·66
(2) NaNO ₃ ...	0·0077 × 170 = 1·31
Na ₂ SO ₄ ...	0·5959 × 142 = 84·62
MgSO ₄ ...	0·299 × 120 = 35·88
CaSO ₄ ...	0·4036 × 136 = 54·89
CaCO ₃ ...	0·2264 × 100 = 22·64

Total of salts ... 229·00

The molecular proportions may also be used with signal advantage for the indirect valuation of alkalis. The direct estimation of soda in waters is a troublesome and lengthy operation, and in technical analyses is frequently omitted. Yet a knowledge of the amount of alkali in waters is often very desirable in order to allow the amounts of the salts to be approximately stated. It is generally im-

practicable to arrive at the amount of alkali by deducting the other constituents from the total solid residue, because many residues rich in sulphates retain water in variable quantity according to the conditions of drying.

But when the lime and magnesia are known, and also chlorine, sulphuric, and carbonic acids (and possibly nitric acid also), the difference between the molecular totals of acids and bases gives a close approximation to the amount of alkali.

In the analysis quoted above the total acids being 1.7837 molecules the bases would be the same, from which, if we deduct 0.929 molecules of lime and magnesia, the residue of 0.8547 is soda (inclusive, of course, of traces of potash). Further multiplying 0.8547 by 62, we get 52.99 grains per gallon, which is little below the actual determination.

The result may be controlled by a direct estimation of the total bases as sulphates.

The following example shows how an indirect determination works out :

Wheatfield water.					
Total solids 79.24 at 100° C. At 140° 78.12.					
		Grains per Gallon.	Molecular Weights.	Molecular Proportions.	
Cl	...	9.70	÷ 71	0.1366	
SO ₃	...	4.66	÷ 80	0.0582	
CO ₂	...	21.56	÷ 44	0.4900	
					0.6848
Na ₂ O by difference	[40.12]	÷ 62		[0.6473]	
MgO	...	0.5	÷ 40	0.0125	
CaO	...	1.4	÷ 56	0.0250	
					0.6848
		Molecules.	Grains.		
(2) NaCl	...	0.1366 × 117 =	15.98	Salts	75.75
Na ₂ SO ₄	...	0.0582 × 142 =	8.26	SiO ₂	2.5
Na ₂ CO ₃	...	0.4525 × 106 =	47.96	Fe ₂ O ₃	0.84
MgCO ₃	...	0.0125 × 84 =	1.05		
CaCO ₃	...	0.025 × 100 =	2.5		79.09
Total salts	...		75.75		

ON OXIDIZED OILS.

By J. LEWKOWITSCH, PH.D.

(Read at the Meeting, March 5, 1902.)

IN my last paper, read before this Society at a meeting, November 1, 1899,* I pointed out that the examination of the "oxidized acids" occurring in blown oils and solid linseed oil had been taken in hand by me.

This investigation has made very slow progress, and I should not have published the following incomplete results had not a paper appeared by Em. Lecocq and

* ANALYST, 1899, p. 319.

TABLE III.—*Oxidized Acids.*

I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.
Acid Value.	Sap. Value.	II.-I.	Iodine Value.	Total Soluble Acids.	Hehner Value.	Acetyl Value.		Sap. Value of Acetylated Acids.	IX.-II.	True Acetyl Value $\times$ 0.55.	Hehner Value of Acetylated Acids.
	Mgrms. KOH.	Mgrms. KOH.	Per Cent.	Mgrms. KOH.		Ap- parent.	True.	Mgrms. KOH.			
Blown Ravison rape oil	171.5	208.0	36.5	49.14	22.56	102.5	80.0	307.5	99.5	44.0	—
Blown East India rape oil	173.3	211.3	38.0	39.79	22.35	128.0	105.65	315.9	104.6	58.1	—
Blown cottonseed oil	174.7	220.71	46.01	48.6	36.12	154.4	118.28	322.69	101.98	65.02	83.85
Solid linseed oil (linoleum mass)	—	—	—	46.49	59.68	164.67	104.99	341.43	86.29	57.74	76.38
Blown maize oil	171.94	215.74	43.60	70.87	48.0	173.58	126.68	326.45	111.11	69.67	—

TABLE IV.—*Fatty Acids freed from Oxidized Acids.*

I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.
Acid Value.	Sap. Value.	II.-I.	Iodine Value.	Total Soluble Acids.	Hehner Value.	Soluble Acids.	Acetyl Value.		Sap. Value of Acetylated Acids.	X.-II.	True Acetyl Value $\times$ 0.55.	Hehner Value of Acetylated Acids.
	Mgrms. KOH.	Mgrms. KOH.	Per Cent.	Mgrms. KOH.			Ap- parent.	True.	Mgrms. KOH.			
Blown Ravison rape oil	176.8	188.6	11.8	61.88	6.97	6.75	42.5	35.53	220.3	31.7	19.54	—
Blown East India rape oil	166.6	176.8	10.2	55.93	10.09	8.85	47.13	37.54	219.2	42.95	20.64	—
Blown cottonseed oil	188.0	196.15	8.15	56.02	11.0	7.27	33.69	22.69	232.0	33.6	12.49	96.17
Solid linseed oil (linoleum mass)	179.97	187.58	7.61	61.31	18.89	—	50.25	31.36	246.11	58.53	17.24	96.05
Blown maize oil	172.37	177.68	5.31	85.52	6.14	7.54	43.8	36.7	228.76	50.52	20.18	—

H. Dandervoort (*Chem. Revue*, 1902, 13), which partly covers the same subject, although it refers to blown colza oil only.

The oils I chose for examination were: Commercial blown Ravison oil, commercial blown East India rape oil, commercial blown cottonseed oil, solid linseed oil (so-called "scrim" oil), and blown maize oil.

All the values that have been determined in these oils are set out in Table No. I., headed "Blown Oils" (see p. 140).

For the preparation of the oxidized acids, 100 grammes were saponified in the usual manner, the total fatty acids separated, and the separation of the oxidized acids from the other acids effected by means of petroleum ether.

The total fatty acids as well as their components—viz., the oxidized acids and the acids freed from oxidized acids—were examined, and the values so obtained are set out in Tables II., III., and IV. (see p. 141).

On acetylating the *original oils*, it was found that emulsions were formed in the washing-out process in the case of blown Ravison oil, rape, cottonseed oil, and maize oil. This has been pointed out already by Archbutt, but the separation caused little trouble. The blown Ravison oil formed the strongest emulsion; the scrim oil caused more trouble, the acetylated product separating as a sticky mass denser than water.

In contradistinction to the behaviour of the oils, the total fatty acids, which were also acetylated, did not give emulsions, as has also been pointed out by Archbutt.

Oxidized Acids.—The values obtained on examination are set out in Table No. III. The acetyl values were determined by the filtration method. As found before in the case of the oxidized acids from solid linseed oil, all the oxidized acids showed considerably higher saponification values than acid values. The surmise that these acids would be saturated acids is not borne out by experiment, for the iodine values are comparatively high. A difficulty arose in the determination of the iodine values, inasmuch as the oxidized acids were found to be practically insoluble in carbon tetrachloride, hence strong alcohol was used as a solvent. The error, if any, introduced thereby cannot have been a considerable one, for while a blank test with carbon tetrachloride required 50.6 c.c. of thiosulphate, the alcoholic solution took 50.00 c.c.

To obtain the true acetyl value the total soluble acids had to be determined. Naturally one would have expected to find no soluble acids, as they should all have been washed away or dissolved out in the treatment with petroleum spirit. However, considerable quantities were found in each case. The explanation suggested itself that these soluble acids were formed on treatment with the alcoholic potash by the action of the latter on the oxidized acids, for the soluble acids were determined after the original substance had been boiled with excess of alcoholic potash for the determination of the saponification value.

If this explanation be the true one, then a check experiment with the oxidized fatty acids as they were obtained originally should give no soluble acids on washing, but the actual experiment gave considerable amounts of soluble acids, in some cases almost approaching those obtained after treatment with alcoholic potash. This is shown in the following table:

SOLUBLE ACIDS IN OXIDIZED ACIDS.

Oil.				After boiling with Alcoholic KOH.	By washing with Water.
Blown Ravison rape	...	...	...	22.56	21.38
„ East India rape	...	...	...	22.35	9.5
„ cottonseed I.	...	...	...	36.12	16.36
„ „ II.	...	...	...	26.30	21.39
Solid linseed	...	...	...	59.68	24.11
Blown maize	...	...	...	46.90	19.20

No such differences were observed in the cases of the total fatty acids and the fatty acids freed from oxidized acids, as will be seen from the following table :

SOLUBLE ACIDS IN

OIL.	TOTAL FATTY ACIDS.		FATTY ACIDS FREED FROM OXIDIZED ACIDS.	
	After boiling with Alcoholic KOH.	By washing with Water.	After boiling with Alcoholic KOH.	By washing with Water.
Blown Ravison rape	7.26	7.09	6.97	6.75
„ East India rape	10.71	9.84	10.09	8.85
„ cottonseed	12.94	12.99	11.0	7.27
„ maize	29.4	24.8	6.08	7.54

Unfortunately, the soluble acids in the solidified linseed oil oxidized acids have not been determined, as it was taken for granted at the time that they were free from soluble acids, which now appears to be very doubtful.

The values obtained by multiplying the true acetyl values by 0.55 are again remarkably low, as they should have been, of course, 100 per cent. This proves that the molecular weight of 300 is not to be taken without further evidence.

The differences between the saponification and acid values point to the presence of lactones. Further investigation is in hand, but so far it appears pretty certain that the oxidized acids are not insoluble in water, and it is not unlikely that they split off volatile fatty acids when treated in a current of steam.

Acids freed from Oxidized Acids.—It was to be expected that these acids would have no acetyl value. If such a one were obtained, it would perhaps point to the presence of hydroxy-acids, which are soluble in petroleum ether. The considerable acetyl values found and set out in Table IV. may be due to oxidation having taken place after isolation, although free access of air had been guarded against. The acids still possessed considerable iodine values, and the differences between saponification and acid values again point to the presence of lactones, although their proportion can be only very small, not amounting to more than 4 to 6 per cent. Even these acids contain small amounts of soluble acid, as shown in the table.

Further examination must show whether, under the conditions I worked with, the oxidized acids are completely insoluble in petroleum ether, for small experiments

seem to show that the petroleum spirit solution of the fatty acids does dissolve some oxidized fatty acids.

The further examination of the oxidized acids is in hand, and experiments must show whether the preparation of their esters or of salts will give an insight into their nature.

As evidenced by the figures given in the table headed "Oxidized Acids," they must contain lactonic substances, since otherwise the differences between the acid and saponification values would not be explicable. If that difference be due to lactones, then it should be possible to separate them in the usual manner—viz., by neutralizing the acids with aqueous potash and extracting the solution with ether. The supposed lactones so obtained were very thick, viscous liquids, soluble in alcohol, with the exception of those lactones that were obtained from solidified linseed oil.

The saponification values of these lactones are given in the following table, Column I. The soap solution was decomposed by mineral acid, and the acid values of the recovered fatty matter determined. No lactone had been reformed, because on boiling with alcoholic potash no further amount of alkali was absorbed :

Lactones from :	Saponification Value. I.	Acid Value of Fatty Acids recovered from the Saponified Lactones. II.
Blown Ravison rape	117.8	125.3
„ East India rape	42.72	80.25
„ cottonseed	72.116	86.6
Solid linseed	35.51	57.44
Blown maize	101.1	106.9

The aqueous soap solution of the oxidized acids after the removal of the lactones was treated with mineral acid under ether, so that the separating fatty acids were immediately dissolved.

The following table shows that in the fatty matter so obtained some lactonic substances had been formed again, as evidenced by Columns I. and II. :

OXIDIZED ACIDS FREED FROM LACTONES.

	Acid Value. I.	Saponification Value. II.	Fatty Matter recovered from Soap Solution, obtained sub. II.		
			Acid Value. III.	Saponification Value. IV.	Difference. V.
Blown Ravison rape	172.2—175.6	220.6—221.5	184.8	223.7	38.9
„ East India rape	194.0—195.4	237.7—247.6	198.5	234.1	35.6
„ cottonseed	177.9—204.5	215.1—222.9	190.2	221.7	31.5
Solid linseed	190.8—194.5	255.5	212.9	249.8	37.9
Blown maize	182.2—284.3	216.0—217.7	185.8	218.8	33.0

The solutions were very dark, so that it was very difficult to titrate accurately, hence the somewhat considerable differences between duplicate determinations.

The solutions containing the completely saponified mass were treated with mineral acid, and the fatty matter so recovered again examined for acid and saponification values, with the results set out in Columns III. and IV. of the last table. Allowing for the errors caused by the very dark solution, the numbers given under Columns III. and IV. may perhaps be looked upon as giving practically the same values as those stated in Columns I. and II., with the exception of solid linseed oil. The practically constant differences in Column V. are notable.

The process of re-extracting the lactonic substances, etc., was repeated once or twice, but lactonic substances were always formed again.

My thanks are due to Messrs. C. D. Robertshaw and George Warburton for the numerous analyses made in the preparation of this paper.

DISCUSSION.

Mr. JENKINS said that in dealing with blown cotton oil of about 0.975 specific gravity he had found that the fatty acids from such oil were distinctly more soluble in methylated ether than in petroleum spirit, which appeared to confirm the author's experience. It was a rather peculiar fact that the blowing of these oils decreased their miscibility with petroleum compounds. The blown oil could be mixed or blended only to a slight extent with American petroleum; it mixed, however, a little more freely with Scotch petroleum, and comparatively easily with Russian petroleum. Another peculiarity, probably due to the oxidized condition of the fatty acids, was that the sulphuric acid reaction increased out of proportion to the iodine value, whereas in the case of most oils a certain ratio existed between these two factors. The bromine thermal rise also did not bear a normal relationship to the iodine value; there was generally a low Hehner value and a low flash-point. The flash-point might be 100° lower than that of the original oil.

Mr. ALLEN said that although the author had stated that at present the exact bearing of all these figures could not be definitely laid down, nevertheless, the accumulation of data of this kind was extremely valuable, and would probably be followed by the removal of the difficulties which at present existed, and by a consequent better understanding of the chemistry of blown oils. These oils were of an extremely complex nature, and any method by which a proximate analysis of their constituents could be made was of great value.

Mr. HORATIO BALLANTYNE said that he was pleased to see that in their general aspect these figures accorded with the results obtained by Mr. R. T. Thomson and himself some ten years previously. One most interesting point was the very high percentage of soluble fatty acids which blown oils contained. In testing for the presence of blown oil in castor oils of doubtful purity, the percentage of soluble fatty acids—determined just as in the case of butter analysis—was probably the very best criterion by which to judge.

Dr. LEWKOWITSCH said that the miscibility of blown oils with petroleum distillates showed that, after all, in some sense the surmise was correct that these oxidized acids were hydroxy acids, because in that respect these oils approached castor oil, and, in fact, were known, when first brought into the market, as "soluble

castor oil." In regard to solubility, they evidently took an intermediate position between castor oil and the other fatty oils. That Russian petroleum behaved somewhat differently from American petroleum could only be due to a difference in composition. Whilst the American petroleum distillates consisted chiefly of hydrocarbons of the paraffin series, the hydrocarbons of Russian petroleum largely belonged to the naphthene series, and must therefore exhibit a different solubility. He was afraid that he had not a very favourable opinion of the usefulness of the Maumené test and the bromine thermal test. It seemed to him much better to determine the iodine value itself. The low flash-point of blown oil was due to the considerable amount of volatile acids. Of course, the acetyl value, which might be indicative of the presence of castor oil, would break down in these cases. No doubt the determination of the percentage of volatile acids was a very good test indeed. It was somewhat puzzling to find such a large amount of volatile or soluble fatty acids in a product which from its treatment would hardly be expected to contain any volatile fatty acids at all.

THE DETECTION OF ARTIFICIAL COLOURING MATTERS IN FRESH AND SOUR MILK.

BY M. WYNTER BLYTH, B.A., B.Sc., F.I.C.

(Read at the Meeting, March 5, 1902.)

IN view of the recommendations* of the Departmental Committee on Preservatives and Colouring Matters in Food, 1901, we may expect the addition of colouring matters to milk to be at some time or other an offence under the Sale of Food and Drugs Act. On this account I think a few observations and experiments recently made by myself may be of some value to analysts.

The colouring matters which have been used from time to time in milk are numerous, and include annatto, turmeric, saffron, carotin, caramel and coal-tar dyes, but practically at the present time in this country the only colouring matters used to any extent are annatto and coal-tar dyes. That these latter are being used more and more both in milk and other articles of food in place of the natural colouring matters is a matter of common knowledge, and personally I found during the year 1901 no less than 19 per cent. of the retail samples of milk submitted to me for analysis under the Sale of Food and Drugs Act to be coloured with coal-tar dyes.

The coal-tar dye used at present is, as far as my own experience goes, methyl orange (salts of dimethylamido-azo-benzene-sulphonic acid), or dyes very closely allied to this body. Should, however, the addition of colouring matters to milk be prohibited, we may expect the adulterator, as usual, to exercise his ingenuity in order if possible to defeat the analyst, and we shall certainly find many other dyes used. For instance, salts of the aniline base—amido-azo-benzene (aniline yellow), or its dimethyl derivative (butter yellow), salts of amido-azo-benzene-sulphonic acid (acid yellow), salts of diphenyl-amine-azo-benzene-sulphonic acid (orange IV.),

* Recommendation B: "That the use of any preservative or colouring matter whatever in milk offered for sale in the United Kingdom be constituted an offence under the Sale of Food and Drugs Act."

all impart a more or less suitable colour to milk; the other sulphonated azo dyes are not in a pure state so suitable for colouring purposes. Salts of dinitro-alpha-naphthol (Martius yellow), salts of dinitro-ortho and para-cresol (victoria yellow), and certain basic dyes, such as phosphine, might also be used, especially the latter; and if we take into consideration mixtures of various colours, the number of possible dyes becomes very large.

So, although the colouring matters used at present are limited in number, and for the most part easy of detection in fresh milk, I have, in view of probable contingencies, sought for some general method which shall cover as far as possible these future developments. In this country the detection of colouring matters in milk has not received any special attention. H. Droop Richmond ("Dairy Chemistry," p. 139, 1899) recommends the precipitation of the colouring matter and casein with acetic acid, and subsequent extraction of the colouring matter with alcohol. In America A. E. Leach (*Journ. Amer. Chem. Soc.*, 1900, 207) has studied the subject, and devised an excellent general method for the detection of a few colouring matters in fresh milk.

The detection of artificial colouring matters in sour or decomposed milk has, as far as I know, not been previously studied.

The usual test for coal-tar dyes in milk is the addition of hydrochloric acid to the milk itself or to the separated curd, when a pink colour is obtained in the presence of some coal-tar dyes. This test may fail for two reasons: (1) The milk may not be quite fresh;* (2) a coal-tar dye may be present which does not strike a pink colour with hydrochloric acid.

THE ACTION OF DECOMPOSING MILK ON COLOURING MATTERS.

A. *Coal-Tar Colours*.—If a small quantity of an easily-seen dye, such as methylene blue, be added to milk, and if the milk be incubated at body temperature for a few hours, or allowed to stand at ordinary temperature for some days, the blue colour will disappear, leaving the milk quite white. If the sample be now vigorously shaken with air the blue colour will slowly return. If, on the other hand, the milk be made strongly yellow with such a dye as methyl orange, and incubated in the same manner, the yellow colour disappears, and cannot be restored by shaking with air, nor can any pink colour be obtained on the addition of hydrochloric acid. This change takes place with small quantities of dyes very quickly and at very low temperature. Commercial samples of milk dyed with methyl orange may give a pink colour even on the fourth day in cold weather, but in summer they will, as a rule, give no reaction after standing twenty-four hours in the warm laboratory. *The action of decomposing milk on coal-tar dyes is exactly the same as is the action of zinc dust and hydrochloric acid.* This may be proved by the fact that the same decomposition

* To this reason, I think, must be attributed the fact that no coal-tar dye was found in any of the 296 samples examined in the Government Laboratory as recorded in the report of the Departmental Committee on Preservatives, etc., 1901. The Committee evidently recognised the difficulty of examining decomposing foods, for they state "that the characteristic reactions for the colouring agents are frequently interfered with or obscured by the organic matter of the food itself, especially after decomposition has commenced."

or reduction products may be extracted from a dye incubated in milk as may be extracted from the dye when reduced by zinc and hydrochloric acid, and those dyes which are reduced to colourless bodies by zinc and hydrochloric acid, and which are again restored to the original dye by oxidation, are also reduced to colourless bodies by incubation in milk and again restored to the original dye by shaking with air. For example, methyl orange breaks up under the action of reducing agents into dimethyl-para-diamido-benzene and sulphanilic acid. Milk treated with methyl orange and incubated, if rendered alkaline and treated with ether, will yield up to the ether para-diamido-benzene. On evaporating the ether a rose-coloured residue will be observed, especially at the edges of the separated fat. This may be identified as para-diamido-benzene by shaking with 10 c.c. of warm distilled water, separating the fat, and adding to the aqueous solution (1) 2 drops of normal sulphuric acid, (2) 2 drops of saturated sulphuretted hydrogen solution, (3) 2 drops of very dilute ferric chloride solution, and warming, when methylene blue will be formed. By operating as above, as little as 0.00002 gramme of para-diamido-benzene may be detected in 10 c.c. of water, if at the same time a control-tube with the reagents and distilled water is treated in the same manner. This methylene blue reaction is easily obtained with the residue obtained from sour milk when the amount of methyl orange added in the first place is large; but owing to the ease with which para-diamido-benzene oxidizes during the manipulations necessary to isolate it, it is very difficult to obtain with the residue from commercial milks which contain between 1 part of colouring matter in from 100,000 to 300,000 parts of milk. The rose-coloured residue is, however, very characteristic, and may easily be observed, even without separating the fat, in the ether residue from 50 c.c. of commercial milk containing methyl orange.

In the same manner orange IV. yields a residue of impure para-amido-diphenylamine, which with a drop of ferric chloride gives an intense blue-green colour changed to scarlet by strong sulphuric acid. Other dyes yield residues which are either coloured or become so on standing for a little time exposed to the air. A few examples of the nature of the decomposition and reduction products of different dyes are given in the table at the end of this paper, but the important point is, not the absolute recognition of the decomposition product of any dye, but the fact that milk which has never contained a coal-tar dye does not become coloured on shaking with air, and yields from the ether extract no coloured residue or any product which gives any colour reactions with such reagents as ferric chloride or strong mineral acids.

B. Other Colouring Matters.—Annatto, turmeric, saffron, carotin, and caramel are not reduced to colourless bodies by decomposing milk (except perhaps after a very long time).

THE GENERAL EXAMINATION OF MILK FOR COLOURING MATTER.

The colour of the milk should be carefully noted, as some dyes, such as aniline yellow and acid yellow, impart a faint pink colour to the curd of sour milk; butter yellow, on the other hand, rises with the fat, which it at first colours yellow, but afterwards becomes colourless; annatto imparts a characteristic colour to the curd, and, like saffron and turmeric, does not become colourless in decomposed milk;

caramel colours both the curd and the whey. If it be desired to make a comparison between the milk when fresh and after partial decomposition, two portions should be incubated, one containing sufficient formalin to prevent any decomposition.

The following general method will be found most convenient: Take 50 c.c. or more of the milk (as much as can be spared if reduction products are specially looked for) and render it just alkaline to delicate litmus paper, evaporate to a paste, and thoroughly extract the fat with ether. Although turmeric, annatto, and such dyes as aniline yellow are all somewhat soluble in ether from an alkaline solution, yet in the presence of casein such small quantities are dissolved that they may be disregarded. (Phosphine is much more soluble in ether, and should be looked for both in the ether and alcohol extract.) Evaporate the ethereal solution to dryness, shake up the fat with a small quantity of hot distilled water in a small separating funnel, separate the water from the fat, and evaporate to dryness on the water-bath in a small flat porcelain dish; carefully note the colour of the residue (see Table). Pure milk will give no coloured residue. Next, thoroughly exhaust the fat-free milk residue with absolute alcohol, pass the alcohol extract through a small filter, and evaporate to dryness in three or four small flat porcelain dishes; if unreduced artificial colouring matter be present the residue will be coloured orange, yellow, or brown. Wash one of the residues into a test-tube with a small quantity of water made acid with sulphuric acid, the sulphonated azo dyes will be at once indicated by the colour of the solution; shake the solution with ether, this will divide the colouring matters into two groups, as in the table: the natural colouring matters and the non-sulphonated acid coal-tar dyes—*i.e.*, the dyes precipitated by Weingärtner's tannin reagent—being soluble in ether, while the basic dyes and the sulphonated dyes are insoluble in ether. The ordinary tests may then be applied to the remaining portions of the dyes. For the sake of completeness I append to the table some confirmatory tests for the colouring matters most likely to be met with at present in commercial samples of milk:

A. ALCOHOL EXTRACT, COLOURED ORANGE, YELLOW, OR BROWN.

Take up a Portion of the Residue with Dilute Sulphuric Acid and shake with Ether.

THE ETHER DISSOLVES SOME OF THE COLOURING MATTER.		THE ETHER DOES NOT DISSOLVE THE COLOURING MATTER.	
Natural Colouring Matter.	Non-sulphonated Acid Coal-tar Colours, such as:	Basic Coal-tar Colours, such as:	Sulphonated Coal-tar Colours, such as:
Annatto	Aniline yellow	Phosphine	Acid yellow
Turmeric	Butter yellow	—	Methyl orange
Saffron	Victoria yellow	—	Orange IV.
Carotin	Martius yellow		

B. WATER EXTRACT FROM THE FAT.

Note the Colour and apply various Reagents to the Dry Residue.

Colour of Residue.	Probable Original Colouring Matter.	Add a Drop to Ferric Chloride.	To the Ferric Chloride add Strong H_2SO_4 .	Other Reactions.
Brown	Acid yellow	Dark green	Yellow, green on dilution	
Brown	Butter yellow	Dark blue-green	Yellow, green on dilution	To a slightly acid solution of the colouring matter add a few drops of H_2S solution, then ferric chloride, heat—magenta colour.
Brown	Aniline yellow	Yellow	Yellow	Strong H_2SO_4 , or HCl , gives a delicate violet
Yellow	Martius yellow	Red	Yellow	Strong HCl gives a beautiful rose red colour
Yellow	Victoria yellow	Red	Yellow	Same as Martius yellow
Rose red	Methyl orange	Fugative scarlet	Yellow	Treat as with butter yellow, the solution becomes a beautiful blue.
Brown-red	Orange IV.	Green	Scarlet, green on dilution	Treat as butter yellow, the solution becomes dirty violet
Yellow	Unreduced dyes, soluble in ether from alkaline solution			

CONFIRMATORY TESTS FOR THE MORE COMMONLY USED COLOURING MATTERS.

Annatto.—(1) Take up the yellow alcohol residue with weak sodium hydroxide solution, dry a few drops on filter-paper. An orange spot changed to pink by stannous chloride solution indicates annatto. (2) Dissolve the yellow alcohol residue in a little water, add a little alcohol and a few drops of ammonia. Introduce a bundle of white cotton fibres and evaporate the liquid nearly to dryness on the water-bath; wash the fibre, which will be yellow, and then immerse it in citric acid solution, when it will become pink. This excellent test is due to A. Leys, who, however, isolates his annatto in a different manner. (3) A convenient method for dealing with a large number of samples is that proposed by Leffmann and Beam ("Select Methods of Food Analysis," p. 217, 1901). The milk is rendered alkaline by acid sodium carbonate, and a slip of filter-paper allowed to soak in it all night. Annatto causes a reddish-yellow stain on the paper.

Turmeric.—The usual test with boric acid is sufficient.

Caramel.—This is one of the most difficult of all colouring matters to detect in small quantities in milk. Whether it is used in this country is doubtful; it is, however, used in America to some extent (A. E. Leach, Thirtieth and Thirty-first Annual Reports, State Board of Health of Massachusetts). The following modification of the test proposed by A. E. Leach (*Journ. Amer. Chem. Soc.*, xx., 207) I have found to give the best results. It is useless to use any evaporation process, as even with great care some caramel may be formed from the milk-sugar. Obtain a milk known to be free from caramel as a control. Take 50 c.c. of the suspected milk and the same quantity of the control, coagulate each by the addition of acetic acid, strain off the whey from the curd by means of pieces of fine muslin; carefully compare the colours of the whey from both samples. Place the curds in two white porcelain basins and just cover them with strong hydrochloric acid. Compare the colours after they have stood several hours; caramel will be indicated by a brownish-violet colour, but the pure curd will also develop a similar colour after standing for a long time, so that great care must be exercised in coming to a conclusion. The use of the control milk greatly increases the delicacy of the test.

Sulphonated Azo Dyes.—These all strike characteristic colours with strong acids; their presence may be confirmed by allowing the milk to go sour and extracting the decomposition products, or, better, by reducing the extracted dye by zinc and hydrochloric acid, making alkaline with ammonia, extracting the ammoniacal solution with ether, and examining the ether extract.

NOTE.—Since reading the foregoing paper I have fully examined a number of milks for colouring matters. The following results were obtained during the month of March:

	Total Examined.	COLOURED.			Not Coloured.
		Coal-tar only.	Annatto only.	Annatto and Coal-tar.	
A. Retail town samples	50	9	14	6	21
B. Wholesale farmers' samples	29	None	None	None	29

These samples being few in number and representing only one month, are, nevertheless, interesting, in that they show the enormous difference between the town and farmers' samples. These observations are being extended so as to cover the whole year.

DISCUSSION.

Dr. RIDEAL thought that probably the reducing action to which the author had referred was due to micro-organisms. Dr. Pakes had pointed out about two years previously that organisms of the *coli* group produced hydrogen, and, if the reducing action was attributable to organisms of the *coli* group, the occurrence of the bleaching effect also indicated the presence of an organism which ought not to be present in a milk supply. In regard to the possible effect on health of the coal-tar colours

mentioned, it seemed reasonable to look upon them as certainly less injurious than some preservatives were. They were present in very small quantities only, and even phosphine, which many people believed to be very poisonous, had been shown, in some experiments conducted by Professor Ray Lankester and himself, to be capable of being added to the food of small animals in considerable quantities and for considerable periods of time without producing any injurious effect.

Mr. RICHMOND said that the original object of adding colouring matters to milk was to preserve a continuity of colour between the milk produced from grass in the spring and summer and that produced from artificial food in the winter. Unfortunately, however, the practice had developed of preserving, not only continuity of colour in milk all the year round, but continuity between milk and skim milk. Certainly in a large number of commercial milks the colouring was completely overdone, and, to one accustomed to the appearance of milk without added colouring matter, a true effect was not obtained. A very simple test for added colouring matter was to let the milk stand. In the case of genuine high-coloured milk the bulk of the colour rose with the cream and the skim milk remained white, whereas with artificial colouring matter the bulk of the colouring matter would remain in the skim milk, unless the dye happened, as might occasionally be the case, to be one that was practically insoluble in water—such, for instance, as the dye of which methyl orange was the sulphonated derivative.

Dr. J. M. H. MUNRO inquired whether the author had tried the experiment of keeping a sample of sterilized milk at the incubating temperature, and if so, whether decolorization had been observed to take place, and whether decolorization took place after the addition of formalin. He would also like to hear whether the author could give any information as to the proportion which the milk samples coloured with coal-tar dyes bore to those coloured with annatto. It would naturally be imagined that annatto would be more largely used in the country, and coal-tar colours in and around London. He would like to hear what the author considered to be the easiest test for annatto. The simple test mentioned by Mr. Richmond was, of course, only applicable to whole milk, and not to separated milk.

Dr. SCHIDROWITZ said that caramel, although not an injurious substance, sometimes had to be tested for—in spirits, for instance, when it was desired to ascertain whether a spirit was cask-coloured or coloured with caramel. The method generally recommended was that of Amthor, but his own experience with that test was by no means satisfactory. In the case of spirits that certainly were not coloured with caramel, he had obtained the precipitate with paraldehyde which Amthor described; while, on the other hand, a plain spirit, which he had coloured with caramel made by himself, yielded no precipitate whatever. There existed also an idea, which, however, was fallacious, that while naturally coloured spirit was decolorized on the addition of lead acetate or albumin, caramel-coloured spirit was not decolorized. In neither case was the decolorization perfect, although it was somewhat more marked in the case of the cask-coloured spirit.

Mr. WYNTER BLYTH said that he believed he was correct in stating that a pure culture of the typhoid organism in litmus milk did not decolorize the litmus, so that it would appear scarcely possible, from the fact that no decolorization occurred, to

draw a safe conclusion that objectionable organisms were absent. He had found that if a poisonous colour, such as Martius's yellow, were added to milk, the poisonous colour acted as a preservative—an interesting fact which might possibly afford a means of detecting poisonous colouring matters. It would be interesting to see if phosphine acted as a preservative in that way. He was somewhat doubtful whether the simple test mentioned by Mr. Richmond would apply to small quantities of methyl orange. His experience was that methyl orange decomposed very quickly, and probably, on a warm day, by the time the cream had risen properly there would be very little methyl orange left. He had found that butter-yellow rose and coloured the cream, but he believed that this colour was not used very largely, owing to its insolubility in water. He did not think that sterilized milk had any action on artificial colouring matters. He had kept litmus—which decolorized very rapidly in decomposing milk—for several months in sterilized milk without any decolorization; and the same would be the case, of course, if formalin had been previously added to the milk. He thought that probably the reducing action was due to the evolution of hydrogen by micro-organisms, as Dr. Rideal had suggested. The effect was just the same as that of treatment with zinc and hydrochloric acid. It did not occur in the presence of formalin. He could not give any precise information as to the proportion of milk samples containing annatto (see note), but he thought it possible that annatto was used to a considerable extent by country milkmen. Out of two hundred samples taken at railway-stations, as the milk arrived from the farmers, only one was found to contain coal-tar colouring matter. The 19 per cent. referred to represented town samples only. The easiest test for annatto was the one proposed by Leffmann and Bean, and consisted in soaking a piece of filter paper in the milk made alkaline with sodium carbonate, when, if annatto was present, a brown colour was obtained on the filter paper after twenty-four hours.

ABSTRACTS OF PAPERS PUBLISHED IN OTHER JOURNALS.

FOODS AND DRUGS ANALYSIS.

The Detection of Spent Tea-leaves by the Sublimation Test. A. Nestler. (*Zeit. für Untersuch. der Nahr. und Genussmittel*, 1902, v., 245-247.)—For the detection of extracted tea-leaves the author has found the sublimation test (see ANALYST, A. Wynter Blyth, ii., 39) to be very useful. He has also met with a sample of tea containing spent leaves which had been re-rolled and stiffened by means of starch paste. As regards the delicacy of the test, it was found that a small piece of tea-leaf, weighing 0.0011 gramme, gave distinct theine crystals after ten minutes' heating.

W. P. S.

The Analysis of Meat Extracts and Vegetable Extracts. K. Micko. (*Zeit. für Untersuch. der Nahr. und Genussmittel*, 1902, v., 193-210.)—In this paper are

given analyses of various meat and vegetable extracts. The methods employed are those usually used for the separation of the different constituents of these articles. The author also describes methods for the estimation of the creatine and creatinine, and of the xanthine bases in the extracts.

Estimation of Creatine.—Five to 20 grammes of the extract are dissolved in a mixture of 100 c.c. of water and 10 c.c. of dilute sulphuric acid (1 : 3) and boiled under a reflux condenser for three hours. After neutralizing the liquid with sodium hydroxide solution, the xanthine bases are precipitated with acid sodium sulphite and copper sulphate, and filtered off. The filtrate is treated with sulphuretted hydrogen; after the addition of a little more dilute sulphuric acid the copper sulphide is filtered off, and the filtrate evaporated to a syrupy consistency. The residue is washed into a flask with boiling alcohol, and heated for some time under a reflux condenser until the creatinine has passed into solution. The alcoholic solution is then neutralized with alcoholic soda solution, and made just acid with a drop of dilute sulphuric acid. After standing some hours in the cold, the clear liquid is poured off and the residue once more extracted with boiling alcohol. The alcoholic liquids are evaporated, and the residue is again boiled out with alcohol, cooled and filtered. The solution thus obtained is evaporated down to about 300 c.c., cooled, and made feebly alkaline with alcoholic soda solution. The small precipitate which forms is filtered off, the filtrate is gently warmed on the water-bath, and 0.5 c.c. of a concentrated alcoholic solution of zinc chloride is added. The solution is allowed to cool, and the small amount of creatinine-zinc chloride which forms is filtered off. On reducing the filtrate to 30 to 50 c.c. by evaporation, the remainder of the creatinine-zinc chloride is deposited. The nitrogen in the precipitates is then estimated by Kjeldahl's process. Liebig's extract was found to contain approximately 6 per cent. of creatine by this method.

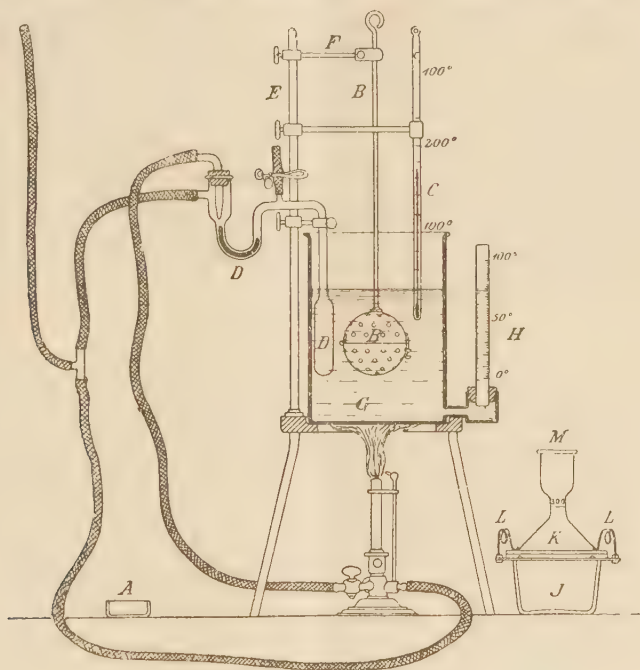
Estimation of Nitrogen occurring as Xanthine Bases.—Ten grammes of the extract are dissolved in 100 to 200 c.c. of water, and heated to boiling. Thirty to 40 c.c. each of saturated acid sodium sulphite solution and a 13 per cent. solution of copper sulphate are added, the solution is boiled for one minute, and allowed to stand overnight. The precipitate is then filtered off, washed with previously boiled cold water, and is placed, together with the filter-paper, in a flask, in which it is boiled, after the addition of a little water acidified with hydrochloric acid. When the paper has broken up, the copper is precipitated as sulphide, and removed by filtration. The cold filtrate is precipitated with silver nitrate solution, after first adding ammonia in sufficient quantity to dissolve the silver chloride which forms, and allowed to stand overnight. The precipitate is now filtered off, washed with dilute ammonia, then with water, and brought into a flask, where, after acidifying with hydrochloric acid, the silver is precipitated as sulphide. The filtrate from the silver sulphide is evaporated down and reprecipitated with ammonia and silver nitrate. This precipitate is washed with very dilute ammonia, then completely with water, and finally with alcohol. The nitrogen it contains is estimated by Kjeldahl's method.

The filtrate from the copper acid sulphite precipitate still contains some xanthine bases. To estimate these the copper is removed as sulphide; the filtrate from the copper sulphide is evaporated, precipitated with ammonia, and the small precipitate

of phosphates which forms on standing is filtered off. The filtrate is then treated with ammonia and silver nitrate, as above. The amount of nitrogen found is added to the first quantity. Liebig's extract was found to contain 0.648 per cent. (average) of nitrogen as xanthine bases, "Sitogen" (yeast extract) 0.637 per cent. The author has not yet determined whether the nitrogen in the silver precipitate exists solely as xanthine bases, nor whether the latter are identical in meat and vegetable extracts.

W. P. S.

Apparatus and Method for Determining the Quality of Gluten. Liebermann. (*Zeit. für Untersuch. der Nahr. und Genussmittel*, 1901, iv., 1009-1016.) The quantity of gluten in wheat does not measure its suitability for baking purposes. A wheat poor in gluten may yield better bread than does a wheat containing a larger quantity. The author, therefore, determines the volume to which the gluten will



swell when heated, and from this calculates the value of the gluten. The method is as follows: 20 grammes of flour and 10 c.c. of saturated gypsum water are well kneaded together into a cake, which is allowed to stand fifteen minutes. The cake is then washed and kneaded by the fingers under a stream of gypsum water until the wash water is clear. The ball of gluten is now placed in a basin of water for fifteen minutes, and is pressed into the small vessel *A*, 4 centimetres in diameter and 1.5 centimetres high. The apparatus for heating this vessel containing the gluten is shown in the accompanying drawing. The vessel is placed in the hinged spherical brass ball, *B*, which is perforated with small holes, and is lowered into the

oil-bath, *G*, which has been previously heated to a temperature of 170° C. As soon as all air and steam have been driven off the level of the oil is read on the scale, *H*. The gluten is heated for fifteen minutes, being kept at a constant temperature by the thermostat, *D*, the level of the oil is again taken, and the sample is then withdrawn from the bath, allowing it to drain for a short time into the bath. Knowing the radius of the bath, the volume of the cooked gluten may be calculated. A simpler means of determining its volume is to measure the amount of alcohol the ball of gluten will displace in the apparatus *J*. Good gluten takes up an almost spherical shape on heating as above, whilst bad samples are not so regular in shape, and have a much smaller volume. The following examples will show the working of the method. It should be mentioned that, when the flour yields more than 40 per cent. of moist gluten, 10 grammes of the flour must be taken instead of 20 grammes.

	A.	B.	C.	D.
Quantity of flour taken	20 grs.	20 grs.	20 grs.	20 grs.
Nitrogen	2.10%	2.22%	1.61%	1.47%
Moist gluten	31.6%	35.2%	24.6%	22.3%
Volume of heated gluten	135 c.c.	120 c.c.	76 c.c.	32 c.c.

An arbitrary valuation is made by assuming that in a good flour the gluten cake expands to a volume of 348 c.c. Hence this value may be found by the formula $V = \frac{K \times 100}{348}$, in which *V* = value and *K* = volume of cake after expansion.

W. P. S.

Recognition of Pasteurized Beer. A. Bau. (*Wochenschr. Brauerei*, 1902, xix., 44.)—The author has already shown that all beers contain invertase, an enzyme which is rendered inactive by heat, and weakened, though not destroyed, by a temperature of from 50° to 57.5° C. In order to employ this enzyme as a test for pasteurization, two quantities of 20 c.c. each of the beer are taken; one is boiled, the other not. To each are added 20 c.c. of a 20 per cent. solution of sugar, the flasks are set aside at atmospheric temperatures for twenty-four hours, treated with 0.5 c.c. of lead acetate, diluted to 50 c.c. with water, filtered, and polarized. If there is a noteworthy difference between the optical activity of the two liquids, the beer was not pasteurized; but if they are alike, or nearly so, the beer had certainly been pasteurized, and at a temperature, probably, exceeding 57° C.

F. H. L.

The Detection of Horseflesh in other Meats. A. Hasterlik. (*Zeit. für Untersuch. der Nahr. und Genussmittel*, 1902, v., 156-158.)—The author records two cases in which he has recently detected horseflesh in preserved meat (corned beef), the seller being convicted after admitting the admixture. The method employed was that in which the iodine number of the intra-muscular fat is determined (see ANALYST, xxii., 104). The first sample (called pickled beef) gave iodine numbers of 72.7 and 72.3, whilst the second (boiled beef) gave 78.9 and 78.5 in two determina-

tions. A sample of genuine pickled beef gave iodine numbers of 56.0 and 55.4. Two other boiled beefs—one lean and the other fat—gave 57.7 and 43.6 respectively.

A. Schuster has communicated to the author the iodine numbers of the intramuscular fat of various samples of beef—roast beef, fillet, etc. The determinations—twenty-nine in all—gave results from 41.9 to 54.0, the average being 47.5. It was found that pickled beef gave a similar ring colouration with iodine (test for glycogen) as did pickled horse-flesh.

W. P. S.

The Application of Serum Diagnosis to the Examination of Food. G. v. Rigler. (*Oesterr. Chem. Zeit.*, 1902, v., 97-100.)—In 1898 Bordet discovered that on injecting cows' milk into rabbits the serum from the animals thus treated gave a precipitate of casein when subsequently introduced into cows' milk. This discovery was supplemented by Wassermann, who, in 1900, found that it was possible in this way to distinguish between the milk of cows and of goats; and he suggested the use of these precipitating agents formed in the sera of animals (*precipitines*) as a general means of distinguishing between different proteids.

Subsequently, in conjunction with Fisch, he demonstrated that each species of animal possessed a specific milk capable of recognition by this test, the precipitate being obtained either with the whole milk or with that greatly diluted.

It was next shown by the experiments of Stern, Mertens, and others, that the serum of rabbits into which human serum, albuminous urine, pleuritic exudations, etc., had been injected was only capable of giving precipitates with those respective liquids.

Then Schütze applied the test to an extract of human muscle, and to vegetable extracts containing proteids, and suggested the application of the method to the examination of artificial food preparations.

Starting with this idea, the author has made experiments to determine whether the specific serum reaction could be used as a means of distinguishing between the cooked and uncooked flesh of different species of animals.

A 20 per cent. aqueous extract was prepared from the flesh of seven different kinds of animals, and from 5 to 10 c.c. of these extracts were injected beneath the skin of rabbits at intervals of three days. After a month the animals were killed, and the serum of the blood separated by centrifugal force.

In each case the supposed specific sera were mixed with clear, filtered aqueous extracts of the flesh of the respective animals in the proportion of 1 to 5, the tubes kept at a temperature of 37° C., and examined after one, two, and three hours.

It was found that the sera only gave a turbidity or precipitate with their corresponding extracts. Thus the serum from the rabbit treated with the extract of horseflesh only gave a reaction with that extract, and not with that of venison, beef, pork, etc. Similarly, the serum from a rabbit treated with an extract of rabbits' flesh reacted with extracts of rabbits' flesh, but not with extracts of the flesh of cats, hares, or other animals, and so on.

In the case of mixtures, the sera only reacted with the extracts of the flesh of the specific animals. Thus a rabbit treated with an extract from a mixture of the

flesh of a hare, calf, deer, and pig, yielded a serum giving a reaction with the extracts of the flesh of each of those animals, but with none of the others. In like manner a serum obtained by injection of an extract of a sausage composed of veal and pork only gave a turbidity with extracts of the flesh of calves, or cows, and pigs. There was no distinction between the flesh of the cow and of the calf. The reactions were obtained as readily with extracts of boiled or roast flesh as with those from raw flesh.

A series of blank experiments with the normal sera of the rabbit, cow, and pig gave negative results with the extracts of all the different kinds of flesh.

The author also made experiments to determine whether the method would be applicable to the detection of different kinds of sugar in honey. It was found, however, that only honey gave any reaction.

E. Ruppin (*Zeit. für Untersuch. der Nahr. und Genussmittel*, viii., 356) has applied the above process successfully to the detection of horseflesh mixed with other flesh. He found that the flesh extract used for control purposes, if acid, gave a spontaneous precipitate under the conditions of the experiment. To avoid this, the author treats the extract with sodium hydroxide solution until it no longer reddens sensitive blue litmus paper, and also adds to the diluted extract (1 : 25) a single drop of 1 per cent. solution of anhydrous sodium carbonate. Flesh extracts so treated gave no precipitate with the serum of untreated rabbits after remaining for several hours in an incubation chamber kept at a temperature of 37° C. The author found that the preservatives potassium nitrate, sodium sulphite, salicylic acid, boric acid, or smoking the meat, were without influence on the reaction. A mixture of minced beef with 5 and 2 per cent. of horseflesh gave the reaction distinctly. The process was tried on various sausages: a reaction was invariably obtained with these when uncooked, slight cooking materially lessened it, and prolonged cooking entirely destroyed it.

C. A. M.

The Alleged Poisonous Properties of "Mandarin" and "Metanil Yellow." G. W. Chlopin. (*Zeit. für Untersuch. der Nahr. und Genussmittel*, 1902, v., 241-245.)—The author finds that "metanil yellow" is harmless, even when given in daily doses of 2 to 3 grammes to dogs and 0.2 gramme to human beings. On the other hand, he does not agree with the statement of Frentzel that "mandarin" is innocuous in moderate quantities (see *ANALYST*, 1902, xxvii., 92-93). Quantities of this colour, given in daily doses of 2 grammes to a dog, caused uneasiness, vomiting, and diarrhoea. The author himself took 0.2 gramme, and the symptoms were so alarming (dizziness, headache, etc.) that the substance had to be removed from the system by means of a purgative.

W. P. S.

Presence of Copper in Powdered Drugs and Chemicals. E. H. Gane. (*Journ. Soc. Chem. Ind.*, xxi., 224.)—Some consignments of powdered ammonium carbonate having developed a blue mottled appearance in consequence of the presence of this impurity, it became necessary to ascertain definitely its origin. It was finally traced to the copper wire or rivets used to fasten the belts that drove the mill. As the belt

wore down small fragments of copper were thrown off and fell into the hopper. The leather belt having been replaced by one of rubber, the trouble ceased. A. M.

ORGANIC ANALYSIS.

Estimation of Potato Starch (Granulose). A. Kaiser. (*Chem. Zeit.*, 1902, xxvi., 180.)—The sample is gelatinized in water in the usual way, so as to form a solution of about 1 per cent. strength, and this must be newly made. Fifty c.c. of the liquid are mixed with 10 grammes of sodium acetate, warmed to 50° C., and then precipitated with 25 c.c. of a solution containing 5 grammes of iodine and 10 grammes of potassium iodide per litre, taking care that a small excess of iodine is present. When the precipitate has settled it is collected on a tared paper and washed with a solution of 3 grammes of sodium acetate in 100 c.c. of water. It is next rinsed by means of alcohol into a porcelain basin, and gently warmed with about 5 c.c. of 5 per cent. alcoholic potash until the change of colour shows that the iodide of starch has decomposed. Sufficient excess of alcoholic acetic acid is then added, and after standing some time (the starch retains alkali with much persistence) it is brought on to the same paper as before, washed with hot spirit, absolute alcohol, and ether, and finally dried for four hours at 120° C. The starch so obtained should be weighed between watch-glasses because of its hygroscopicity; and its purity should be tested by its complete solubility in water, any insoluble cellulose, etc., being dried, weighed, and deducted. F. H. L.

A Method of Determining the Solubility of Alkaloids. R. A. Hatcher. (*Amer. Journ. Pharm.*, 1902, lxxiv., 134-137.)—This method is intended for determining the solubility of alkaloids which do not readily dissolve in water: 0.1 gramme of the alkaloid is rubbed with water so as to form a smooth paste, and then with more water until a smooth mixture of about 9 c.c. is obtained. To this is added from a burette sufficient normal sulphuric acid to just convert the alkaloid into sulphate, and then sufficient water to make 10 c.c. in all.

Portions of 1 c.c. each of this solution are diluted with different proportions of water, and a slight excess of normal sodium hydroxide solution added to each, the solubility being estimated from the relative amounts of precipitate.

Two fresh portions of 1 c.c. are then diluted approximately to the neutralization point, one being taken slightly above and the other slightly below that found in the first determination, and the sodium hydroxide added as before. Finally, a third determination based on the second results will give the solubility by taking the mean between the highest result giving a precipitate and the lowest showing none.

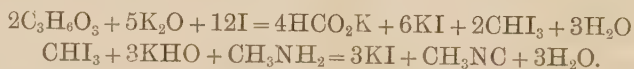
Thus, in the case of cinchonine, a slight precipitate was observed on adding a slight excess of sodium hydroxide to a solution of the sulphate containing 1 part in 22,000, but none in that containing 1 in 24,000, and the solubility was therefore taken as 1 in 23,000.

Applying the test to morphine, the solubility of which is known to be 1 in 4,350,

the author found that on diluting the portions of 1 c.c., and then adding a very slight excess of alkali, a slight turbidity was given with the liquid diluted to 43 c.c., but none with that diluted to 44 c.c. The solubility was therefore taken as the mean of these results, or 1 part in 4,350.

C. A. M.

Detection and Estimation of Lactic Acid in the Gastric Juice. A. C. Vournasos. (*Zeits. f. angew. Chem.*, xv., 172.)—For the detection of lactic acid the author makes use of a reagent containing iodine and methylamine. Half a gramme of potassium iodide is dissolved in 50 c.c. of water, 1 gramme of iodine is added, the mixture is well shaken, then filtered, and 5 grammes of methylamine are added. Of the gastric fluid under examination, 5 c.c. are filtered and, if viscous, diluted. It is made strongly alkaline by the addition of a little 10 per cent. potash solution, then 1 c.c. of the above reagent is added. The lactic acid is converted into iodoform, which, with the methylamine, gives isocyanide:



The penetrating smell of the isocyanide enables one to detect 0.005 per cent. of lactic acid. If less than that quantity be present, a larger amount of the sample should be taken and extracted with ether, the ether extract evaporated, and the residue tested as above. If volatile fatty acids are present, the gastric juice should be evaporated at 100° C. to a third of its volume.

For the gravimetric estimation of the lactic acid take 30 c.c. of the sample, and evaporate it to one-third. Then mix in a retort with 15 c.c. of aqueous caustic potash and 0.5 gramme of sublimed iodine. The mixture is distilled cautiously into a cooled receiver until $\frac{7}{10}$ have passed over. The distillate contains the whole of the iodoform from the lactic acid present. The iodoform may be collected on a tared filter, washed with water, and dried at 60° C. to constant weight.

The determination may also be made volumetrically. To the distillate obtained as above are added 50 c.c. of water and the same quantity of 10 per cent. alcoholic potash solution. The mixture is stirred till clear, then titrated with decinormal silver nitrate solution by an application of the precipitation method for iodides.

A. M.

The Detection of Indican in Urine. Bertault. (*Journ. Pharm. Chim.*, 1902, xv., 277-279.)—In testing urine for indican the blue coloration is sometimes masked by a violet colour, due to the presence of iodine.

In such cases the following modification is recommended: The urine is mixed with an equal volume of hydrochloric acid and shaken with a few c.c. of chloroform and a few drops of a dilute solution of sodium hypochlorite.

The acid layer is removed by means of a pipette, and the chloroform washed with water and then rendered just alkaline by the addition of a few drops of potassium hydroxide solution. The violet colour due to the iodine disappears, and

the chloroform remains blue in the presence of indican, or becomes colourless in its absence.

Care must be taken not to add too large an excess of hypochlorite.

C. A. M.

INORGANIC ANALYSIS.

The Precipitation of Metals by Bismuth Oxide. J. Aloy. (*Bull. Soc. Chim.*, 1902, xxvii., 136, 137.)—Lebaigue (*Journ. de Pharm.*, xxxix., 51) stated that bismuth oxide, when boiled for about fifteen minutes with solutions of metallic salts, precipitated ferric, aluminium, and chromium in the form of hydroxides, but was without action upon ferrous, cobalt, nickel, copper, and lead salts. He recommended the reaction as a means of separating these classes of metals in analysis.

The author, however, finds that the reaction is not so simple as Lebaigue supposed, and that it is not applicable to analytical work. On boiling freshly-precipitated bismuth oxide for an hour with solutions of the different salts, he obtained the following results:

Ferric Salts.—The iron was only completely precipitated from very dilute solutions. The precipitate consisted of oxide.

Ferrous Salts.—Bismuth oxide precipitated the iron in the cold, and more rapidly on boiling, as a white amorphous precipitate, probably consisting of a mixture of basic salts.

Aluminium was only completely precipitated from very dilute solutions. *Manganese* yielded a precipitate of hydroxide, but the precipitation was only partial. *Copper* was also partially precipitated from concentrated solutions, yielding bluish-green basic salts in the case of the chloride, sulphate, and nitrate, and as black hydroxide from a solution of the acetate.

Cobalt, nickel, lead, zinc, and cadmium were also partially precipitated from solutions of their salts.

Anhydrous bismuth oxide behaved in the same way as the hydroxide, but the reactions took place more slowly.

C. A. M.

On the Influence of Hydrochloric Acid on the Precipitation of Cuprous Thiocyanate. R. G. van Name. (*Zeits. anorg. Chem.*, xxx., 122.)—Continuing his investigations on the precipitation of cuprous thiocyanate (*Zeits. anorg. Chem.*, xxvi., 230), the author found that the precipitation is practically complete, provided the amount of free hydrochloric acid left after the addition of the ammonium bisulphite and thiocyanate does not exceed 0.5 per cent. of the total volume of the solution, and also provided that the solution does not contain an excessive amount of ammonium salts, which exert a solvent action on the precipitate. The addition of a moderate excess of ammonium thiocyanate, however, is recommended if the above conditions cannot be satisfied, as cuprous thiocyanate is more insoluble in weak solutions of this salt than in pure water, solutions of other ammonium salts, or dilute hydrochloric acid.

A. G. L.

Use of Phosphoric Acid in Analysis of Iron Alloys. T. H. Byron. (*Journ. Soc. Chem. Ind.*, xxi., 214.)—Ferrosilicon, spiegeleisen, etc., dissolve readily in phosphoric acid, but the silica is left in such a gelatinous condition that filtration is impracticable. Phosphoric acid may, however, be used with advantage to determine chromium in ferro-chromium alloys and in chrome iron ores. The chromium is oxidized with permanganate and titrated with ferrous sulphate and bichromate. The results agree with those obtained by the older, more laborious method. A. M.

Estimation of Sodium Thiosulphate, Sulphite, and Sulphide.—Dupré and W. Korn. (*Zeits. f. angew. Chem.*, xv., 225.)—In order to estimate thiosulphate in the presence of sulphite the latter is decomposed, by boiling with about four equivalents of acetic acid and twelve of sodium acetate for one or two hours. Under these conditions thiosulphate is not decomposed and can therefore be titrated with iodine solution. The time of boiling may be reduced to about half an hour if the last traces of sulphite are removed by oxidation with potassium chlorate. About a gramme of chlorate is added, and the boiling is then discontinued.

If thiosulphate, sulphite, and sulphide all be present, they are first all determined by running into iodine solution acidified with hydrochloric acid. In a second portion the sulphide is precipitated by the addition of cadmium carbonate. The solution is filtered, and the filtrate is divided into two portions. In one portion thiosulphate + sulphite are determined, and in the other thiosulphate is estimated as above. From the three values thus obtained the individual constituents can be calculated by subtraction.

A. M.

The Quantitative Separation of Hydrochloric and Hydrocyanic Acids. Theodore William Richards and Sidney Kent Singer. (*Amer. Chem. Journ.*, xxvii., 205.)—The authors find that hydrocyanic and hydrochloric acids can be quantitatively separated by boiling their aqueous solution for some time, preferably in a common retort, the neck of which is directed upwards at an angle of 45° , the evaporated water being replaced from time to time. The solutions should not be more than tenth normal in regard to the hydrochloric acid. When little or no hydrochloric acid is present, as in the estimation of the chloride contained in potassium cyanide, two hours' boiling is sufficient to remove all the hydrocyanic acid; but when the solution contains a fair quantity of hydrochloric acid eight or nine hours' boiling is requisite. The difference in the behaviour of the two bodies on boiling is due to their very great difference in dissociation in aqueous solution; and the fact that in the presence of hydrogen chloride a longer boiling is necessary to expel all the hydrocyanic acid appears to be due to the formation of complexes between the chlorine ions and the undissociated hydrocyanic acid.

A. G. L.

The Behaviour of Nitric and Nitrous Acids with Brucine and Sulphuric Acid. L. W. Winkler. (*Zeits. f. angew. Chem.*, xv., 170.)—In reply to Lunge's paper (*ibid.*, xv., 1), Winkler finds that the reaction of nitrous acid with brucine

and sulphuric acid depends upon the proportion of sulphuric acid present. If equal volumes of concentrated acid and water be used deep red coloration results. With 2 volumes acid to 1 of water—the proportions recommended by Winkler for water analysis—a rose coloration is produced. With stronger acid the colour becomes less pronounced, and when 4 volumes sulphuric acid are present to 1 volume water—the proportions used by Lunge (*loc. cit.*)—there is no reaction in consequence of the formation of nitrosylsulphuric acid. The results obtained by Lunge are thus brought into agreement with those of Winkler.

On the other hand, nitrates give no reaction unless the acid be strong. With 2 volumes water to 1 volume sulphuric acid there is no coloration, but with 1 volume water to 2 volumes sulphuric acid a nitrate gives a coloration equal in intensity to that given by an equivalent amount of nitrite. By taking advantage of these peculiarities it is possible to test a water separately for nitrates and nitrites, using the same reagents, brucine and sulphuric acid. Lunge (*Zeits. f. angew. Chem.*, xv., 241) confirms Winkler's results and withdraws his previous remarks. A. M.

APPARATUS.

Pressure Regulator for Distillations under Diminished Pressure. W. Burstyn. (*Oesterr. Chem. Zeit.*, 1902, v., 55.)—This is an apparatus designed to keep the pressure inside a distillation-flask automatically constant within certain limits, so that variations in boiling-points, etc., may be avoided. A and B are charged with mercury, and S and D lead to the pump and distilling apparatus. Before beginning to exhaust, the stopper of A is removed, and the vessel is lowered till it is completely full of mercury; then, carefully excluding air, the stopper is put back. The pump is next set going, and when a sufficient vacuum has been attained (say, 20 millimetres) A is raised until the mercury in B touches the lower end of the tube D, thus producing a Torricellian vacuum in A. If, now, the pump becomes more powerful, so that the pressure falls to, say, 15 millimetres, the mercury takes the positions indicated by the dotted lines; but the pressure in the distillation apparatus remains unchanged, because the interposed mercury column, 5 millimetres in height, neutralizes the difference. Conversely, if by evolution of gas or otherwise, the pressure in the apparatus rises to more than 20 millimetres, the pump at once reduces it again. For more highly reduced pressures, such as 5 millimetres or less, the mercury may be replaced by petroleum oil, which is much lighter, and possesses no considerable vapour tension. F. H. L.

Preparation of a Fine-grained Filter-paper. E. Reale. (*Gazz. chim. Ital.*, 1901, xxxi. [2], 452; through *Chem. Zeit. Rep.*, 1902, 68.)—Such a paper may be prepared as follows: A filter is placed in a stoppered funnel, filled with ammonium sulphide, and the sulphur thrown down with 1 : 2 sulphuric acid. After standing five minutes

the cock is opened, the liquid run off, and the paper washed thoroughly with water. Such a prepared filter-paper will be found useful for many purposes. F. H. L.

MILK-BLENDED BUTTERS.

KING'S BENCH DIVISION.

(Before the LORD CHIEF JUSTICE OF ENGLAND, MR. JUSTICE DARLING, and MR. JUSTICE CHANNELL.)

PEARKS, GUNSTON, AND TEE (LIMITED) *v.* WARD—HENNEN *v.* SOUTHERN COUNTIES DAIRIES COMPANY (LIMITED).

From the "Times," April 24, 1902.

THE first of these cases was an appeal from a conviction by the justices of Richmond, Surrey, under the Sale of Food and Drugs Act, 1875, Section 6. Three informations were preferred by the respondent against the appellants under this section, charging them with having sold to the prejudice of the purchaser butter which was not of the nature, substance, and quality demanded, the butter having had water added beyond the usual limit of 16 per cent. natural to butter. The magistrates convicted the appellants, and fined them £25 and costs. The appellants were a limited company under the Companies Act, and carried on business as provision merchants. The respondent, who was an agent of the Butter Association, caused one Annie White to purchase on his behalf at the appellants' shop in Richmond three packets of butter, which on analysis were found to contain respectively 24·7, 23·7, and 20·4 per cent. of water. It was admitted by Annie White that she understood Pearks' butter was moist, and that she could see it was moist, but that she asked for butter and expected to get butter. It was also admitted by respondent that he was not surprised on seeing the result of the analysis to be that the butter was adulterated with water, but that when the purchase was made he expected to get pure butter. It was proved that the excess of water was due to added milk. There was no evidence that at the time of sale the attention of the purchaser was drawn to the nature and composition of the article. The magistrates found as a fact that the purchaser did not know that the butter asked for contained such an excessive amount of moisture as was shown by the analysis.

MR. MACMORRAN, K.C. (Mr. Joseph Ricardo with him), for the appellants, contended that, as the appellants were a limited company, they could not be convicted. Section 6 of the Act referred to "the person"; and though the Interpretation Act, 1889, Section 2 (1), enacted that the word "person" in a statute should include corporation, unless the contrary intention appeared, *mens rea* on the part of the person accused was necessary, and this was impossible in the case of a corporation. He referred to "Betts *v.* Armistead" (20 Q.B.D., 771) and "Pharmaceutical Society *v.* London and Provincial Supply Association" (5 Q.B.D., 310, and 5 App. Cas., 857). Further, there was no sale to the prejudice of the purchaser, as White knew that the butter was moist and the respondent was not surprised at the analysis. That amounted to this—that the respondent knew what he was buying. He cited "Mason *v.* Cowdary" (1900, 2 Q.B., 419).

MR. MORTON SMITH, for the respondent, submitted that want of *mens rea* was no defence under this section. It was so held in "Betts *v.* Armistead." A master employing a servant was responsible under this Act for the acts of the servant—"Brown *v.* Foot" (61 L.J., M.C., 110)—unless the master proved that the servant was expressly prohibited—"Kearley *v.* Tonge" (60 L.J., M.C., 159).

MR. MACMORRAN, in reply, cited "Abrath *v.* North-Eastern Railway" (11 App. Cas., 247) and "Hotchin *v.* Hindmarsh" (1891, 2 Q.B., 181).

The second of the cases was an appeal from a decision of justices acquitting the respondent

company in proceedings under Section 6 of the Sale of Food and Drugs Act, 1875, on the ground that the section did not apply to corporate bodies.

Mr. RICKETTS argued the case on behalf of the appellant; the respondents were not represented.

The court gave judgment in the two cases together, dismissing the appeal in the first case, and allowing the appeal in the second.

The LORD CHIEF JUSTICE, in delivering judgment, said that in the first case the prosecution was under Section 6 of the Sale of Food and Drugs Act, 1875, for selling Pearks' butter, and it was contended that the information would not lie because the defendants were a limited company. There was another point—namely, that there had been no sale to the prejudice of the purchaser, because the woman who actually made the purchase knew that she would get moist butter. With regard to the latter point, it seemed to him that they had not to deal with the knowledge of the actual purchaser, except so far as the actual purchaser had been informed by the seller, because, of course, the person who bought on behalf of the inspector generally had knowledge, but the court had to consider the case of an ordinary purchaser. It was also impossible to hold that a statement by the woman that she knew that the butter was moist imputed knowledge of the extent of extra moisture in the article in question in the case. As to the question of the liability of a corporate body, which was the important question, it seemed to him very much the same question as that arising in civil proceedings as to the responsibility of the master for the acts of his servant. A corporation ought to be within the provision in question unless *mens rea* was an element of the offence. The language of Section 6 of the Sale of Food and Drugs Act was: "No person shall sell to the prejudice of the purchaser any article of food . . . which is not of the nature, substance, and quality of the article demanded by such purchaser under a penalty." Section 2 (1) of the Interpretation Act, 1889, provided that "in the construction of every enactment relating to an offence punishable on indictment or on summary conviction . . . 'person' shall, unless the contrary intention appears, include a body corporate." He could not see in Section 6 of the Act of 1875, or in any of the circumstances involved in what was contemplated by that section, any contrary intention whatever. It was clear that with reference to Sections 3 and 5 different considerations arose, but with reference to Section 6 he thought the point really covered in principle by the decisions. The protective object of the section and the expedients of the offence alike pointed to an intention to put a corporation in the position of an individual. He came to the conclusion that there was nothing within the meaning of the Interpretation Act disclosing a contrary intention. He thought, therefore, that the section applied to a corporation. The appeal in the first case must be dismissed. In the second case the appeal must be allowed, and the case remitted to be further dealt with.

Mr. JUSTICE DARLING and Mr. JUSTICE CHANNELL delivered judgments to the like effect.

HAYES v. RULE AND LAW.

This was an appeal by way of special case from a decision of the justices for the Redditch Division of Worcestershire dismissing an information laid by the appellant, a police inspector duly authorized to act under the Sale of Food and Drugs Acts, against the respondents under Section 6 of the Sale of Food and Drugs Act, 1875, charging the respondent Rule with selling as butter an article not of the nature, substance, and quality of the article demanded, and charging the respondent Law with aiding and abetting in the commission of the offence.

The facts stated in the case were to the following effect: On September 26, 1901, a Mrs. Dutfield, the wife of a police constable, acting under the direction of the appellant, went to a retail shop of Messrs. Pearks, Gunston, and Tee (Limited), in Redditch. She asked the shop-assistant Rule (the respondent) to supply her with half a pound of best fresh butter. It was supplied to her, and she paid 6d. for it. Shortly after this Mrs. Dutfield pointed to another lump on the counter, and said she would have half a pound of that butter. It was supplied and

handed to her, and she paid 5½d. for it. At this point the appellant came into the shop, and the requirements of the Act were complied with. Each lot of butter when handed to Mrs. Dutfield was wrapped in a paper bearing the following statement: "This is choicest butter blended with pure English full-cream milk, whereby the percentage of water in the butter is increased to about 24 per cent." When the appellant came into the shop the respondent Law (the manager of the shop) pointed to a printed notice hung in the shop in these terms: "All butter sold at this establishment is Pearks' milk-blended butter, and is choicest butter blended with pure English full-cream milk, whereby the percentage of water in the butter is increased to about 24 per cent." This notice was hanging in such a position as to be facing and readily seen by any purchaser coming into the shop, though the appellant denied having seen the notice up to the time he began dividing the butter, but he admitted that, if he had so wished, he could have read the notice. There were two such notices in the shop. The appellant before purchasing had read of cases affecting Pearks' butter, and knew how the company were trading, but did not know anything about butter. The certificate of the analyst, in which he stated that in his opinion the sample of butter had been adulterated by the addition of water to the extent of 4·6 per cent., was put in. It was contended on behalf of the appellant that the wrapper and notice did not protect the respondents; that it had not been proved that the notice was seen by the purchaser prior to the completion of the purchase; that the recognised standard of moisture in butter was 16 per cent., whereas the analyst's certificate proved that the butter, the subject of the charge, contained 20·6 per cent.; that the onus lay upon the respondents to show how the excessive amount of moisture came to be in the butter, and that if they failed to satisfy the justices that it arose from causes beyond their control, or was not intentionally introduced by mixing milk with the butter, then the offence was complete, and no label they could frame would protect them against what was alleged on the appellant's behalf to be the fraudulent purpose of the respondents. It was contended on behalf of the respondents that the appellant had not made out a case; that the notice which had been settled for the respondents' employers by a learned King's counsel entirely protected the respondents; that there was not any legal standard as to the percentage of water in butter; that the prosecution had no case, the notice clearing the respondents from liability and disposing of any plea that the appellant might urge of fraudulent intent; that the appellant had admitted that before he went to the shop he knew what he went to purchase; that before sending Mrs. Dutfield to make a purchase the appellant admitted having read of previous cases and knew how the respondents' employers were trading, that they were selling milk-blended butter, and did not require notice to be put prominently before him. It was also contended that the notice protected the respondents from the charge that the goods were sold to the prejudice of the purchaser. The justices determined that as the appellant had by his agent asked to be supplied with butter, and had received an article which was not pure butter, although an article of commerce, the sale was a sale to the prejudice of the purchaser. But they held that the respondents were entitled to the protection afforded by Section 8 of the Act by reason of the printed notices exposed in the shop, and by reason that the butter sold to the appellant was wrapped in a printed notice disclosing the fact that the article was a mixture, and having regard to the admissions of the appellant that he knew how the respondents' principals were trading. The justices accordingly dismissed the information subject to the present case.

Mr. Amphlett, K.C., and Mr. Carmichael appeared for the appellant; and Mr. Asquith, K.C., Mr. Avory, K.C., and Mr. Frampton for the respondents.

The court yesterday dismissed the appeal.

The LORD CHIEF JUSTICE said that in this case the court was asked to set aside an acquittal on a prosecution under Section 6 of the Sale of Food and Drugs Act, 1875. His Lordship wished the ground on which he thought the acquittal right to be distinctly understood, in order that the judgment of the court might not be supposed to involve larger issues than it did. The present case was, in his opinion, essentially different from that of *Pearks, Gunston, and Tee v.*

Houghton" (18 the *Times* Law Reports, 362), which had been recently before the court, in that in the present case one had the purchaser asking for half a pound of the best fresh butter. The justices had found that what was supplied was not best fresh butter; so far, therefore, there appeared to be a sale to the prejudice of the purchaser. Under these circumstances, speaking for himself, he did not think it would have been sufficient for the respondents to rely on the notice hung in the shop without showing that it was called to the attention of the purchaser, because, as the purchaser asked for best fresh butter and nothing further was said, there would remain the question whether he saw it. But the justices had found that the respondents were protected by Section 8, because the article was sold with a notice disclosing the fact that it was a mixture. Unless that notice was so put round the butter that it would not be seen or was covered over with another paper, or something of that kind, the justices were quite right in holding it a good notice under Section 8. Mr. Amphlett had contended that there ought to be a specific finding that the label would have been seen by the ordinary purchaser. But unless that had been so, the justices would not have found that the article was wrapped in a notice "disclosing the fact that the article was a mixture." The other point raised was that there was no finding in the case negating the suggestion that the admixture of the water was intended fraudulently to increase the bulk, weight, or measure of the article. But it was plain that if that point had been raised before the justices they must have intended to negative fraud. Therefore he thought that in this case the label was a good defence under Section 8.

Mr. JUSTICE DARLING and Mr. JUSTICE CHANNELL concurred.

KING'S BENCH DIVISION.

(Before the LORD CHIEF JUSTICE OF ENGLAND, Mr. JUSTICE DARLING, and Mr. JUSTICE CHANNELL.)

BAYLEY *v.* PEARKS, GUNSTON, AND TEE (LIMITED).

From the "Times," May 1, 1902.

THIS was an appeal by way of special case from a decision of three justices for the county of Southampton dismissing an information laid by the appellant against the respondent company under Section 8 of the Sale of Food and Drugs Act, 1899, charging them with selling to the appellant a quantity of margarine the fat of which contained more than 10 per cent. of butter fat. The substance in question was "Pearks' milk-blended butter," and was sold as such, with a label stating that it was "choicest butter blended with pure English full-cream milk, whereby the percentage of water in the butter is increased to about 24 per cent." The usual proceedings under the Sale of Food and Drugs Acts were gone through. The analyst's certificate which was put in stated that the substance contained 72·35 per cent. fat, 23·30 per cent. water, 2·55 per cent. lard, and 1·80 per cent. salt, and that the "butter" was adulterated with excess of water to the extent of 7·3 per cent. The analyst was called as a witness. He proved that the 72·35 was butter fat, and was the only fat present; that the texture of this butter differentiated it from ordinary butter; he was sure there had been a secondary manufacture, and that, in his opinion, it was a compound article; it was not adulterated with any other substance than water. On behalf of the appellant it was contended that this milk-blended butter was margarine, and must be dealt with under the Margarine Acts. It was not the substance usually known as butter, but was compounded of certain ingredients—namely, butter properly so called and milk unconverted into butter, and underwent a second process of manufacturing. It was made by mixing two kinds of butter together by means of adding milk or cream. It was a mixed article and made in imitation of butter, and came within the definition of margarine in Section 3 of the Margarine Act, 1887. On behalf of the respondents it was contended that the

article was butter, that it was admitted to be two butters blended together and could not be called an imitation of butter. That margarine was made from beef fat or some other like substance, and that if mixed with butter became margarine; but that it could not be contended that two butters mixed together became margarine or were anything else than butter. That the article came within the definition of butter in Section 3 of the Margarine Act, 1887. That the article was made exclusively from milk or cream only, and no other substance whatever was mixed with it. The justices were of opinion that the article in question was not margarine as defined by the Margarine Act, 1887, and they dismissed the information, subject to the present case.

Mr. DANCKWERTS, K.C. (with whom was Mr. Emmanuel), contended that the substance was "margarine" within the meaning of the Margarine Act, 1887, by reason of the definition of "margarine" in Section 3 of that Act. This definition was incorporated into the Act of 1899. The substance therefore came within the prohibition in Section 8 of that Act against selling margarine of which the fat contains more than 10 per cent. of butter fat.

Mr. ASQUITH, K.C. (with whom were Mr. Macnorrnan, K.C., Mr. Frampton, and Mr. Ricardo), contended that the substance was not margarine within Section 8 of the Act of 1899. It was not necessary to read into that section the definition in the Act of 1887 in all its amplitude. Further, the substance was not "margarine" within the definition in the Act of 1887. It was butter within the definition of butter in that Act. True, if a purchaser asked for butter simply, this substance would not be sold to him without explanation, because it was not the ordinary butter the purchaser must be taken to demand. But it did not follow it was not butter within the definition of the Act of 1887.

The court dismissed the appeal.

The LORD CHIEF JUSTICE, in giving judgment, said that the information was for selling margarine the fat of which contained more than 10 per cent. of butter fat. The magistrates had dealt with the information by holding that the substance sold was not margarine. The force of Mr. Danckwerts' argument rested upon the following facts: When the Legislature enacted Section 8 of the Sale of Food and Drugs Act, 1889, it used the word "margarine." There was in the Margarine Act, 1887, a definition clause enacting that "'margarine' shall mean all substances, whether compounds or otherwise, prepared in imitation of butter, and whether mixed with butter or not, and no such substance shall be lawfully sold, except under the name of margarine, and under the conditions set forth in this Act." By Section 25 of the Act of 1899 expressions in that Act were to have the same meaning as in the Sale of Food and Drugs Acts and by Section 28 of that Act the Margarine Act, 1887, was included among these Acts. Mr. Danckwerts had contended that the expression "margarine" must include the substance now in question, because the definition from the Act of 1887 had to be applied, and, since it was prepared in imitation of butter, it could only be sold under the name of margarine, and being margarine could not be sold at all if it contained more than 10 per cent. of butter fat. The answer was that, looking at the Act of 1899, it was quite plain that the Act did contemplate certain things which, according to this argument, ought to be called margarine, and yet which were called by a different name. In Section 1 of the Act, "adulterated or impoverished butter (other than margarine)" was referred to as one of the articles which was not to be imported except upon certain conditions. It would follow, if Mr. Danckwerts' argument was right, that if impoverished butter was imported it could only be sold as margarine, and that it could not be sold at all if it contained more than 10 per cent. of butter fat. That was the logical result of the argument. The facts as to the substance in question in the case were perfectly well known. It was butter mixed with milk, and it could not be sold as butter because of Section 6 of the Sale of Food and Drugs Act, 1875. But it might be sold under that Act with a proper protective label. Now, it was contended that it could not be sold at all because it contained more than 10 per cent. of butter fat, and had been made "margarine" by Act of Parliament. He thought it was

butter and milk mixed together, and he found nothing to compel him to say that butter and milk mixed was not to be sold except as margarine, or, what was more important, was not to be sold at all. He thought the magistrates were perfectly right; the substance was not margarine, but butter and milk.

Mr. JUSTICE DARLING and Mr. JUSTICE CHANNELL delivered judgment to the same effect.

AMOUNT OF WATER IN MARGARINE.

JOSEPH BURTON AND SONS (LIMITED) *v.* MATTINSON.

This was an appeal by way of case stated from a decision of justices convicting the appellant company, under Section 6 of the Sale of Food and Drugs Act, 1875, of selling margarine not of the nature, substance, and quality demanded by the purchaser.

The facts were as follows: On December 9, 1901, the appellants exposed for sale at their shop at Rushden, Northamptonshire, a substance labelled margarine and ticketed for sale at 6d. per pound. The respondent entered the shop and called for 1 pound of margarine, to be supplied out of the margarine so exposed for sale, and he was served with 1 pound of the substance, for which he paid 6d. The formalities required by the Act were carried out, and the substance was duly analysed. It was admitted that the appellants had complied with all the requirements of the law as to labelling and selling the substance sold as margarine. The analyst's certificate stated that the sample contained the percentage of foreign ingredients as follows: "Water, 21 per cent. (and this was at least 5 per cent. in excess of the amount of water which margarine should contain.)" It was objected on behalf of the appellants that the words in brackets were no proper part of the analyst's certificate, but were a mere expression of opinion, which was in no way receivable in evidence. It was stated by the analyst, who was called as a witness for the respondent on the requisition of the appellant, that the average percentage of water contained in margarine was from 8 to 10 per cent., so that, in stating in his certificate that this sample contained at least 5 per cent. in excess of the maximum amount which should be present in margarine, he was dealing with the margarine leniently and allowing the same maximum as is allowed in butter—namely, 16 per cent.; that margarine, in his experience, should contain rather less moisture than butter; that well-made butter contains 10 to 12 per cent. of water on an average; that the principle or valuable constituent of butter was fat, of which the percentage should be from 80 to 85; that the only valuable constituent of margarine was also fat, of which it should contain at least 85 per cent.; that this particular sample contained only 70 per cent. of fat, so that what was lacking in fat was made up in water and salts; that margarine was made from various fats, either animal or vegetable—it was usually made from the more liquid portions of animal fat mixed with various vegetable fats; that margarine should, in his opinion, imitate butter, not only in appearance, but also in its constituent elements. It was admitted that there was nothing in the substance sold injurious to health, and that margarine was sold at times in the district for as much as 8d. to 10d. per pound, and for as little as 4d. per pound, so that 6d. per pound was the price of a comparatively cheap quality of margarine. It was admitted by the two witnesses of the respondent that the sample sold was in outward appearance an imitation of butter. No evidence was given on the part of the appellants, but it was contended by counsel for the appellants on the above facts that the appellants had committed no offence in point of law, because (1) the term "margarine" was not a conventional term or one affixed by usage to any substance, but was a statutory term affixed by the Margarine Act, 1887, to all substances, whether compounds or otherwise, prepared in imitation of butter, and that the substance then in question being prepared in imitation of butter was rightly sold as margarine, and was, therefore, of the nature and substance demanded by the purchaser; (2) the quality of the substance supplied was that demanded by the purchaser, being the margarine at 6d. per pound then exhibited for sale in the appellants' shop at Rushden; (3) the Legislature had not

fixed any standard for margarine nor enacted of what ingredients it should be composed nor the proportions in which they should be combined; (4) if it be necessary that a substance sold as margarine should imitate butter, not only in outward appearance and nature, but in the ~~that~~ its used in its composition, the substance then in question, being not only similar to butter in such outward appearance, but also being composed of the same ingredients as butter—namely, fat, water, and salt—was margarine, and an article of the nature, substance, and quality demanded. It was contended for the respondent that, although the Legislature had not fixed any standard for margarine, neither had it fixed any standard for butter, and yet there had been several convictions for selling butter which contained more than 16 per cent. of water, and such convictions had been upheld on appeal, and that if it was illegal to sell butter with more than 16 per cent. of water, it was also illegal to sell margarine with more than the same percentage. That if it was lawful to sell as margarine a substance containing 21 per cent. of water, there was no reason why such substance should not be sold containing 40 or 50 per cent. of water. That water was not a substance prepared in imitation of butter within the definition of margarine contained in the Margarine Act, 1887. The justices overruled the appellants' objections, being of opinion that the water found in the margarine was excessive, and that, therefore, the article sold was not of the nature, substance, and quality demanded, the same being adulterated with water, and they convicted the appellants subject to the present case, imposing a penalty of £1 with costs.

Mr. Avory, K.C., and Mr. W. H. Stevenson appeared for the appellants; and Mr. Swinburne-Hanham for the respondent.

The court dismissed the appeal yesterday.

The LORD CHIEF JUSTICE said that in this case the magistrates, the sale being a sale of margarine, and the provisions of the Margarine Act, 1887, having been complied with, had found that the water found in the margarine was excessive, and that, therefore, the article sold was not of the nature, substance, and quality demanded, the same being adulterated with water. That meant that the substance was margarine and water, and not margarine. The Court had been pressed to say that this finding could not stand, because there was no evidence on which the magistrates could come to the conclusion that the substance was margarine and water. It was contended that the whole matter was governed by Section 3 of the Margarine Act, 1887, which enacted that "the word 'margarine' shall mean all substances, whether compounds or otherwise, prepared in imitation of butter, and whether mixed with butter or not, and no such substance shall be lawfully sold except under the name of margarine and under the conditions set forth in this Act." It was contended that, if a person sold any imitation of butter and called it margarine, there would be practically no inquiry into the nature of the substance. The objection to this contention was that it overlooked the provisions of the legislation under which the purchaser is entitled to get what he asks for. He did not say that the presence of any particular percentage of water prevented an article from being margarine. But the court had merely to see whether there was any evidence that the article in question was not margarine but margarine and water. The analyst's certificate said that the substance contained 21 per cent. of water, "and this was at least 5 per cent. in excess of the amount of water which margarine should contain." Unless the analyst was called the certificate was, under the Act, sufficient evidence of the facts therein stated. The defendant could, however, require the analyst to be called. In this case this was done, and the analyst in his evidence stated the line of reasoning which led him to the conclusion that he was right in stating that margarine should not contain so large a percentage of water as was present in this case. The analyst's reasoning had been criticised. It was said he ought not to have compared margarine with butter. But no evidence had been called on the point; and it was impossible to say that the magistrates were not justified in relying on the certificate supplemented by the analyst's evidence, and in holding that the substance was margarine and water and not margarine.

Mr. JUSTICE DARLING and Mr. JUSTICE CHANNELL delivered judgments to the same effect.

MILK OF INFERIOR QUALITY FROM A SINGLE COW.

KING'S BENCH DIVISION.

(Before the LORD CHIEF JUSTICE OF ENGLAND, MR. JUSTICE DARLING, and MR. JUSTICE CHANNELL.)

SMITHIES *v.* BRIDGE.

From the "Times" of May 3, 1902.

THIS was an appeal from the Chelmsford Quarter Sessions. The case raised an important question as to whether a person supplying milk exactly as it came from a cow could be convicted of an offence against Section 6 of the Sale of Food and Drugs Act, 1875, if the milk was of inferior quality. The following facts appeared from the case stated.

The appellant, William Smithies, of Clacton-on-Sea, was convicted at Thorpe le Soken Petty Sessions, under Section 6 of the Sale of Food and Drugs Act, 1875, for selling to the respondent on August 15, 1901, to the prejudice of the purchaser, milk not of the nature, substance, and quality demanded, and he was fined £20. Smithies appealed to Quarter Sessions, when the following facts were proved: The respondent asked to be supplied with a pint of new milk, and on analysis it was found to contain only 2·09 per cent. of fat. The milk had not been tampered with or adulterated in any way, but was in the same condition as when it came from the cow. The small percentage of fat was caused by there being a long interval of sixteen hours between the morning milking, at which the milk in question was drawn from the cow, and the previous milking. The owner of the cows had been told by veterinary surgeons that this system of milking, while it increased the quantity of milk at the morning milking, caused it to be deficient in fat, as the latter became absorbed. The cows were not the property of the appellant, but of Mr. Thomas Lilly, from whom the appellant purchased the milk under a guarantee, but the appellant did not rely upon this guarantee as a defence. The justices at the Quarter Sessions were of opinion that there had been no adulteration of or abstraction from the milk, but that, nevertheless, the offence charged had been proved. They confirmed the conviction, and reduced the fine to £1.

MR. WARBURTON, for the appellant, said that as this was milk exactly as it came from the cow, it was pure milk, although of inferior quality, and therefore the appellant could not be convicted—"Hoyle *v.* Hitchman" (4 Q.B.D., 233) and "Morgan *v.* Auger" (L.J. Newsp. for April 26, 1902, p. 228).

MR. C. E. JONES, for the respondent, submitted that it was a question of fact for the justices—"Hewitt *v.* Taylor" (1896, 1 Q.B., 287), "Dyke *v.* Gower" (1892, 1 Q.B., 220). He referred to the Sale of Milk Regulations, 1901, made by the Board of Agriculture, after the date of the alleged offence, prescribing that where milk contained less than 3 per cent. of fat it should be presumed till the contrary was proved that it was not genuine.

MR. JUSTICE CHANNELL, in giving judgment, said that the court were not agreed as to the result, but he was not sure that there was any large difference between them as to the principles in question. It was material to recollect that the prosecution was under Section 6, under which it had been clearly decided that there was no question of guilty knowledge or fraudulent intent. The question merely was whether the person charged had sold something different from, and inferior to, the thing demanded by the purchaser. The case of "Goulder *v.* Rook" (1901, 2 K.B., 290) brought out these propositions. That was a case of beer, which was a manufactured article, but in the case of a natural product, such as milk, the same principles were applicable. If a person asked for new milk and got something which was not that which he would expect to get as new milk, the offence had been committed. If in ordinary cases the person charged was able to prove that what he had sold as milk was the identical thing, without adulteration and without manipulation, that came from the cow, then, unless there was something further, he

clearly proved that the substance sold was milk. If the man did not know, and made inquiries and discovered that the cow had some illness, that would confirm the analysis, and go to show that the thing sold was not of the nature, substance, and quality of the article demanded. He had sold something which was the direct product of the cow, but in the case his Lordship was putting it was a cow which was not producing milk, but another liquid, and on those facts the seller, though perfectly innocent, ought to be convicted under this section. One had to apply those principles to the present case. The view of the magistrates was that there was no reason for suspecting any mistake in the analysis, and that it showed that there was a smaller quantity of fat than even the poorest kind of milk contained, and that, by reason of the cow being milked at unusual times, the substance that came from the cow was not a substance that could properly be called milk. That seemed to him to be a question of fact, and if it was not milk, it was not of the nature, substance, and quality demanded. It was not for the court to interfere with a conclusion of fact. This might be a hard case, but, if they did not lay down a rule such as he had done, it might do mischief in other cases.

Mr. JUSTICE DARLING said that he was very sorry that he did not agree. The purchaser asked for new milk, and he got milk exactly as it came from the cow. What he got was undoubtedly new, and the question was whether it was milk. In ordinary language it was milk, and it was exactly in the condition in which the cow gave it. If a man asked for milk, he meant cow's milk, but not the milk of a diseased cow. Seeing that it was food, he must be understood to demand milk fit for human consumption. If it was not milk, what was it? Some cows gave richer milk than others; and, there being no standard, the appellant supplied what he was perfectly entitled to describe as milk. If this was only a case of milk, he should not trouble to differ from the other judges, but he feared that the decision might be applied to some other natural product as to which there was no standard—*e.g.*, apples from an apple-tree which was sending the malic acid into its roots, although in so preposterous a case his brother might be able to distinguish it. It was a principle capable of dangerous application to say that a man could be convicted where, without any element of fraud, he sold a natural product in the state in which it was produced.

The LORD CHIEF JUSTICE said that he could not distinguish in this case between Lilly and the appellant. The magistrates had dealt with it as a question of fact, and, if there was evidence on which they could come to the decision they did, the court ought not to overrule it. For the reasons given by his brother Darling, he came to the conclusion that it was not possible to distinguish between the appellant and Lilly; and the only question was whether there was evidence that the article sold was not of the nature, substance, and quality demanded. The milk was deficient in 30 per cent. of the fat proper to genuine milk. If there had been evidence that the milk came direct from the cow, and no evidence of an abnormal condition of things, it would have been wrong to convict. But in this case it was found that the condition of the milk was due to the way in which the cows had been milked—*i.e.*, there had been an abnormal interval of sixteen hours. The magistrates had found that it was so deficient in fat that it could not fairly be described as milk. He did not say that he would have come to the same conclusion, but it was impossible to say that there was no evidence that it was not ordinary new milk. He did not wish to say that there was any arbitrary standard. The order of the Board of Agriculture did not establish a standard for what was or was not genuine, but only *prima facie* evidence. It could still be proved by the defendant that the milk was genuine. If it turned out that the article produced was the result of an abnormal condition of things, whether from disease or from abnormal treatment, there was evidence on which the justices might find that the article was not of the nature, substance, and quality demanded. The purchaser, when he asked for new milk, was entitled to have an article which was not other than ordinary new milk by reason of any special way in which the cows had been treated.

The appeal was accordingly dismissed, but without costs.